CLAIMS

What is claimed is:

1. A method of operating a fuel cell system having a fuel cell stack operable to produce an electric current, the method comprising:

(a) producing a power output with the fuel cell stack to meet a power demand placed on the fuel cell system;

(b) detecting a decrease in said power demand;

(c) routing an excess power output of the fuel cell stack to a component of the fuel cell system; and

(d) reducing said power output of the fuel cell stack to meet said decreased power demand placed on the fuel cell system.

2. The method of claim 1, wherein (c) includes routing at least a portion of said excess power output to a coolant pump motor in the fuel cell system.

3. The method of claim 2, wherein (c) includes operating said coolant pump motor at its maximum output.

4. The method of claim 1, wherein (c) includes routing at least a portion of said excess power output to a radiator fan motor in the fuel cell system.

5. The method of claim 4, wherein (c) includes operating said radiator fan motor at its maximum output.

6. The method of claim 1, wherein (c) includes routing at least a portion of said excess power output to at least one heater in the fuel cell system.

7. The method of claim 1, wherein (d) includes gradually reducing said power output of the fuel cell stack.

8. The method of claim 1, wherein (d) includes maintaining a pressure differential between an anode and cathode flow in the fuel cell stack below a predetermined value.

9. The method of claim 1, wherein (d) includes maintaining a relative humidity in the fuel cell stack within a predetermined range.

10. The method of claim 9, wherein (d) includes maintaining said relative humidity in the fuel cell stack between about 70 to 100 percent.

11. The method of claim 1, wherein (c) and (d) are performed substantially concurrently.

12. The method of claim 1, wherein the fuel cell system includes an energy storage device and (c) includes routing said excess power output to said energy storage device.

13. The method of claim 1, wherein (c) includes routing as much excess power output of the fuel cell stack as possible to a coolant pump motor in the fuel cell system, routing as much as possible of any remaining excess power output to a radiator fan motor in the fuel cell system, routing as much as possible of any remaining excess power output to a heater in the fuel cell stack, and routing any remaining excess power output to other components in the fuel cell system.

14. A method of managing a pressure differential between anode and cathode flow fields in a fuel cell stack of a fuel cell system during a downward transient in a power demand placed on the fuel cell system, the method comprising:

(a) detecting a decrease in the power demand;

(b) routing an excess power output of the fuel cell stack to a component of the fuel cell system; and

(c) gradually reducing a power output of the fuel cell stack to meet said decreased power demand placed on the fuel cell system while maintaining a pressure differential between the anode and cathode flow fields below a predetermined value.

15. The method of claim 14, wherein (b) includes routing at least a portion of said excess power output to a coolant pump motor in the fuel cell system.

16. The method of claim 14, wherein (b) includes routing at least a portion of said excess power output to a radiator fan motor in the fuel cell system.

17. The method of claim 14, wherein (b) includes routing at least a portion of said excess power output to at least one heater in the fuel cell system.

18. The method of claim 14, wherein (b) includes operating said component of the fuel cell system at its maximum setting.

19. The method of claim 14, wherein the fuel cell system includes an energy storage device and (b) includes routing said excess power output to said energy storage device.

20. The method of claim 14, wherein (b) and (c) are performed substantially concurrently.

21. The method of claim 14, wherein (b) includes routing as much excess power output of the fuel cell stack as possible to a coolant pump motor in the fuel cell system, routing as much as possible of any remaining excess power output to a radiator fan motor in the fuel cell system, routing as much as possible of any remaining excess power output to a heater in the fuel cell stack, and routing any remaining excess power output to other components in the fuel cell system.

22. A method of maintaining a relative humidity in a fuel cell stack of a fuel cell system between a predetermined range during a downward transient in a power demand placed on the fuel cell system, the method comprising:

(a) detecting a decrease in the power demand;

(b) routing an excess power output of the fuel cell stack to a component of the fuel cell system; and

(c) gradually reducing a power output of the fuel cell stack to meet said decreased power demand placed on the fuel cell system while maintaining a relative humidity in the fuel cell stack between the predetermined range.

23. The method of claim 22, wherein (b) includes routing at least a portion of said excess power output to a coolant pump motor in the fuel cell system.

24. The method of claim 22, wherein (b) includes routing at least a portion of said excess power output to a radiator fan motor in the fuel cell system.

25. The method of claim 22, wherein (b) includes routing at least a portion of said excess power output to at least one heater in the fuel cell system.

26. The method of claim 22, wherein (b) includes operating said component of the fuel cell system at its maximum setting.

27. The method of claim 22, wherein the fuel cell system includes an energy storage device and (b) includes routing said excess power output to said energy storage device.

28. The method of claim 22, wherein (c) includes maintaining said relative humidity in the fuel cell stack between about 70 to 100 percent.

29. The method of claim 22, wherein (b) and (c) are performed substantially concurrently.

30. The method of claim 22, wherein (b) includes routing as much excess power output of the fuel cell stack as possible to a coolant pump motor in the fuel cell system, routing as much as possible of any remaining excess power output to a radiator fan motor in the fuel cell system, routing as much as possible of any remaining excess power output to a heater in the fuel cell stack, and routing any remaining excess power output to other components in the fuel cell system.